Laboratory 3
Digital I/O and Finite State Machine

Due Date: 3 Mar 2020 Name:_____

Points: 100 Points
Work individually.

Objective: The purposes of this laboratory are to develop your understanding of the PIC digital I/O capabilities, to begin familiarization of the Digilent **MX7** board I/O configuration, and to enhance your microcontroller programming skills, by implementing a finite state machine. In this lab you will begin using c function libraries that are included using the *#include <plib.h>* command in your c source file. The c library reference manuals are posted on UNM Learn.

Activities: For this assignment, you will write a **main** routine which implements a finite state machine. You will use the LEDs to indicate the state and output functions and the switches to provide the nickel and dime inputs. Your program will implement the functionality that is necessary to purchase an item which costs 30 cents.

You will assign state numbers to the individual states and light LED1, LED2, and LED3 to indicate the state number. (I recommend 0,1,2,3,..) Your initial state number will be 000, or all three LEDs unlit. You will use LED4 to indicate when a product has been dispensed. If change is to be issued, your program should flash LED1, LED2, and LED3 momentarily before they all return to the unlit condition. Your code should use the following state definitions:

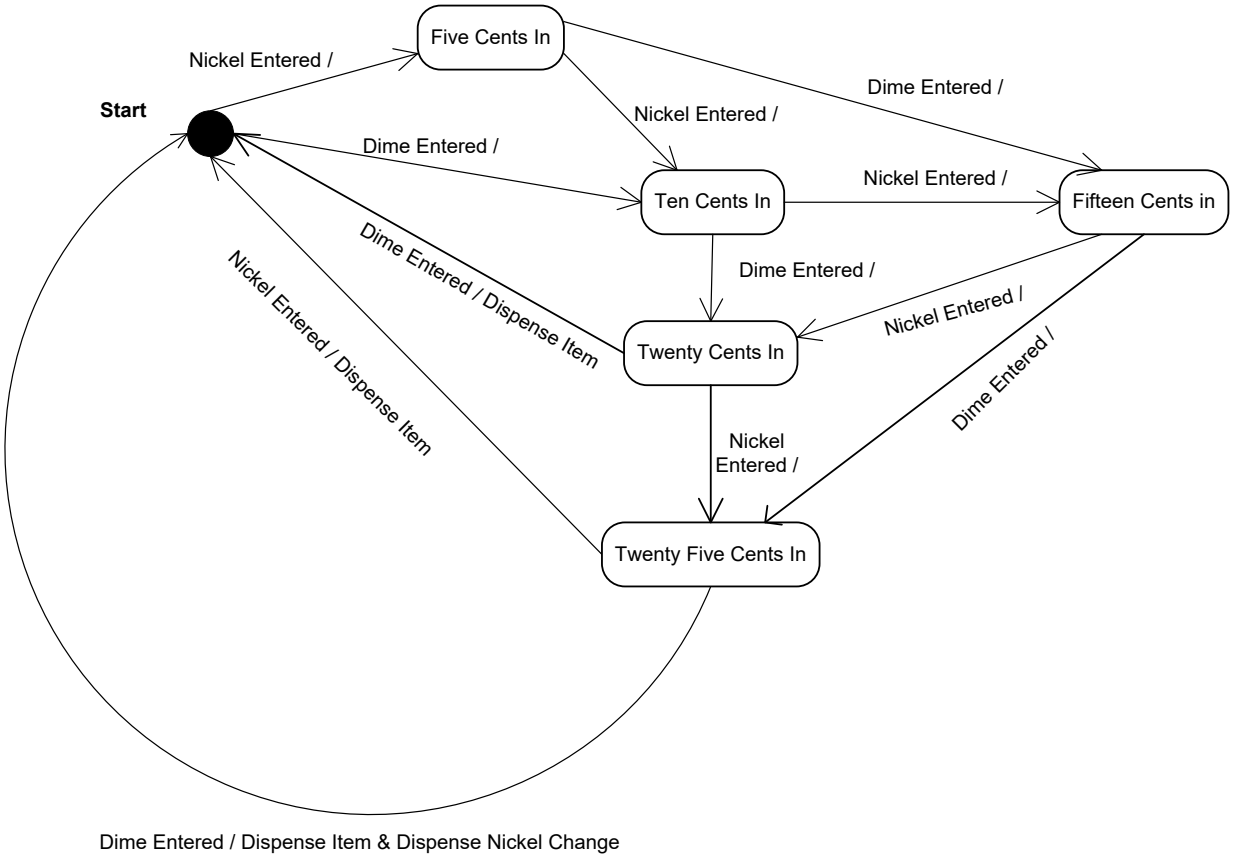
State	Binary Representation
No money in - Start	000
5 cents inserted	001
10 cents inserted	010
15 cents inserted	011
20 cents inserted	100
25 cents inserted	101

You will simulate a nickel input using switch BTN1 (RG6) and a dime input using BTN2 (RG7). You will find that you need to use the delay function to ensure that you can observe the illumination of the LEDs and to correctly read the switches, as we will not be using interrupts to detect a change of input state. The delay will also prevent the system from cycling through the states if a button is held down too long.

You will use BTN3 as a reset button which will refund all money entered and reset the state to 0 if the system is not already in the zero state. When the reset is pressed, your program

should flash LED1, LED2, and LED3 momentarily before they all return to the unlit condition.

The required behavior of your finite state machine is shown in the drawing below:



Documentation: Your lab activities must be documented following the guidelines that are provided on the course UNM Learn site. You must also demonstrate that your project functions properly to one of our TAs; who will then sign your copy of this assignment sheet.

Your report must include a copy of your code and the code must include your name and date in the header section. Format your code to remove excessive blank lines and white space so that is legible and does not waste paper. Your code will be examined to ensure that your code is not a copy of someone else's.

Reference Information:

- Digilent Pro MX7 Board Reference Manual
- PIC32MX5XX/6XX/7XX Data Sheet
- PIC32 Peripheral Libraries for MPLAB C32 Compiler
- PIC32 Reference Manual Section 12, Ports

Suggestion: Keep all of your files on a USB memory device as there is no guarantee that any information you store on lab machines will be preserved. On occasion, the machines must cleaned and reloaded, so any information stored on them will be lost.